
Hints and Kinks for Restoring Boatanchors

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The response from my previous ER article, "Restoration of a Central Electronics 600L Amplifier" amazed me. I received many emails asking additional questions about restoration techniques and ideas. It is clear that there are many who are in the process of or are about to begin a restoration project. Wonderful! The process is enjoyable and very satisfying. The purpose of this article is to answer some of the questions I have been asked about the restoration process and to provide some additional basic restoration information. Please understand that the techniques and notes herein are from my own experiences in restoring many vintage transmitters and receivers but may not necessarily be what others do. There are many excellent restorers who may have alternate favorite techniques and no doubt you'll find your own favorite techniques. What is important is to start!



These are some of my favorite cleaning and polishing supplies. Note the toothbrush, a great tool for getting into corners for cleaning and polishing.

There are many ways to define restoration but there is no "right" way. Do what pleases *you*. Some want original and others—like me—want certain improvements based on what we have learned over the past 40-50 years. Personally, I like to make everything as cosmetically perfect as possible and I don't mind making changes to this end. Others may disagree. I'll also make some circuit changes too; for example, reducing the load on a power transformer or reducing heat buildup inside a chassis. Other changes might include a 3-wire line cord for safety. This list is endless, but again, there is no right or wrong. For just about any piece of gear someone will have info on recommended changes. Use Google and the various equipment reflectors to find detailed information. The knowledge base provided by users on the reflectors is awesome.

In most cases a restoration project will require troubleshooting and what you can do here is a function of your own expertise and available test equipment. If you lack knowledge in this area there are always plenty of folks willing to lend a hand. A note of caution: if you're new to repair and troubleshooting **PLEASE** remember that even a small receiver can kill you. Think **SAFETY FIRST**. Don't work on anything if you're tired.

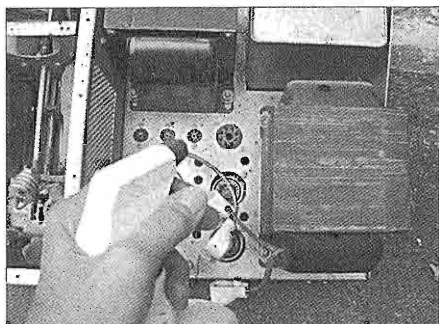
At the end of this article I'll provide a step-by-step restoration summary. Now, here are some answers to questions I have been asked:

1. "Did you say 'wash' the chassis? Can I do this without damage? What's the procedure you use?"

Cleaning is sort of an art and you learn as you proceed. Yes, you can wash most pieces of equipment without damage. Some precautions need to be taken, of course. Remove as many items from the chassis as possible (it's always easier to

clean an individual part) such as tubes and their shields, any plug-in modules, knobs, meters, any delicate assemblies, indicator bulbs, tuning indicators, etc. I always (if possible) completely remove the front panel and any easily removable supporting hardware which makes getting into hard to reach areas much easier.

The cleaning technique is a function of the original condition of the chassis and



A good way to apply cleaning solution is with a hand sprayer. Don't be stingy! As you spray, use a small brush to work on the dirty areas, then rinse.

whether it's aluminum or steel (the chassis is usually cadmium plated).

The first step is to get rid of the major accumulated dirt and dust. Spray a mixture of 50/50 Formula 409® cleaner and ammonia on everything. Use heavier amounts on really dirty areas. Avoid spraying directly into IF cans and on open transformers. After letting it sit for a minute or two, scrub areas of heavy dirt with a brush. It's good to have a selection of various sizes and hardness. Now, rinse thoroughly with water and use plenty! Again, avoid spraying directly onto open transformers, IF cans, and other obvious items. If some areas are still dirty, repeat the process.

A compressor is a necessary restoration tool. When you're happy with the results of the wash, blow out excess water with compressed air and then let everything dry in the sun if possible. Anything washed in this manner should sit a few

days before proceeding.

The chassis may now be improved by polishing, using various techniques. Be prepared to spend lots of time. If the chassis is aluminum, I use various polishes with my favorite being Wenol®. Apply it with an old towel, and use lots of elbow grease and then remove residue. I use water on a rag for this. If the chassis is steel it's tougher to deal with, but I use a combination of #0000 steel wool, metal polish applied with small nylon brushes and a Dremel® tool.

2. "What's a Megger or hipot tester? What are they, what are they used for? Also, when doing resistance checks on transformers, are you looking for shorts between primary and secondary windings?"

A Megger is an acronym for Megohmmeter, and is an instrument that is used to check insulation (leakage) resistance. A high voltage (usually around 1-3 kV) at very low current is applied between a lead and the case, and the resultant resistance is displayed on a meter. This is a mandatory tool for testing transformers and chokes. You are looking for shorts between winding(s) and between windings and the transformer case itself. A short between primary and secondary windings is easily detected with a common VOM. Hipot testers are fancy versions of the more basic Megger. Check this Internet URL for some more details:

<http://www.tpub.com/doeelecsceince/electricalscience2172.htm>

You can find Meggers and hipot testers on eBay for very reasonable prices. I test every large transformer and choke as part of the restoration process.

3. "You spoke of carefully cleaning the front panel so as not to disturb any of the silk screening. Do you use anything (cleaning solvent) in particular?"

Here you need to be very careful. Test a cleaning material using the mildest approach first, and take it **s-l-o-w**. Start with warm water; then maybe liquid hand

soap, then window cleaner, then Formula 409®, etc. You get the idea. An excellent solvent is denatured alcohol which works quite well in many cases. What you end up using is a function of how bad the panel is when you start. Remove the front panel completely if possible – it makes it easier to work on. If you leave the panel in place, at least remove the knobs and clean them separately.

4. "You talked about 'bandswitch markings that had been rubbed off,' and that they 'were repaired with dry transfers and burnished into place.' Is this a difficult procedure? Is this something that can take place on any front panel negating the need for complete silk screening and repainting?"

A steady hand is required! Yes, in this case the *only* problem with the front panel was missing lines around the bandswitch. I used dry transfers (available from any number of sources) and selected a line the same width and color as what is on the panel. I carefully *cleaned* the panel (this is very important), applied the decal, and burnished it into place. The best burnishing tool is a soft ("B" or "1") lead pencil - one of my secrets. Now you know it. This technique can make an otherwise ugly panel look pretty good. Of course, if the panel is very poor with many markings and the lettering gone, then the panel will need to be scanned, artwork generated and a silkscreen made. The panel is then stripped, painted, and screened. This is somewhat expensive but the result is a perfect panel. (I have silkscreens for a variety of panels. Contact me if you're looking for something!)

5. "You talked about giving a cleaned front panel 'a coat of furniture oil to give it a new look.' That really sounds great! Do you recommend any particular product, and do you have any precautions that might be taken during this activity? What about doing the case too?"

Use the oil sparingly! Wipe with a soft cloth. Any brand will do, I use Old English®. Don't do the cabinet unless

it's a smooth finish. If the cabinet is a textured finish, use denatured alcohol to clean and leave it at that. I sometimes use a pure paste wax (such as butchers wax) which can make an old panel look quite good.

6. "Next, you talked about polishing the meter face (in my case, the whole meter just because I want the whole thing as nice as possible) and the knobs. I've tried several plastic polishes and none of them give the knobs that nice, shiny



Applying metal polish to a bakelite knob - use only a little!

appearance I'm looking for. Do you recommend another chemical that will indeed make my knobs sparkle? Also, I've been trying to do this with rag wheels on my Dremel® tool. Would you suggest another method?"



Polishing a knob using a small 6-inch buffing wheel in a drill press.

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I have found only one good way to polish plastic knobs (most boat anchor knobs are bakelite). First, clean the knobs with soap and water and scrub them with a brush. You are removing years of dirt. Hold the knobs with a short length of 1/4 rod. Then, use a buffing wheel running at about 1800 RPM because faster speeds might melt the plastic knob. A drill press is a good tool to hold the buffing wheel. Use a loose buffing wheel with a paste-type fine polishing compound. Remove excess polish with a clean, soft rag and your knobs will look better than new.

7. "You spoke of cleaning the chassis, metal, components, wire harnesses, sockets, and connectors with rags and cotton swabs. I'm not afraid of spending the necessary hours - I just don't know how to do it, and what to use to make things beautiful. I've seen pictures of equipment that has been restored to better-than-new condition, and I've always wondered what was done to polish the chassis, IF cans, filter capacitor's housings, etc."

In most restorations it's simply not practical to remove everything from the chassis. In the case of Collins (and others), rivets are used as fasteners - ouch! Remove what you can - tubes, meters, dial assemblies, etc. Cleaning takes time. Clean the dirt first using whatever solvent works - soap and water; the Formula 409® and ammonia mixture; etc. Use cotton swabs and a variety of small brushes for hard-to-reach areas. A Dremel® tool with a flex accessory and nylon brushes is great for getting into those areas. You will find your own favorite technique. See elsewhere in this article for more cleaning suggestions.

8. "You mentioned 'relay contacts were burnished and switches were cleaned with DeOxit®.' I need to get a good burnishing tool, and I ordered and received a 25-ml plastic bottle of 100% DeOxit® with a needle dispenser. When that's applied to rotary contacts, and other switches, is there any physical action that

should be taken to further clean those contacts? Should the switches be taken apart (carefully so as to be able to put them back together again - HA!) to make sure the rings are cleaned on both sides? Or is this going a bit too far?"

No, there is no need to disassemble the rotary switches! What a job! DeOxit® will do the trick. Also, lube the switch detent with a dab of lithium grease. Oh, and after applying the DeOxit®, exercise the switch a few times. Use DeOxit® on all potentiometers as well.

9. "During restoration, you had the cabinet sent out for repainting. You spoke of custom auto-body shops as those qualified to do that kind of thing. Would you suggest a powder-coating procedure, or can an auto body shop match the colors properly, and bake the paint on satisfactorily? What about a wrinkle finish like that on my Viking II? Can this same body shop do that kind of thing as well?"

Auto paint shops are pretty good at matching paint. Powder coat is great if you can find someone to do it. The nice thing about powder coat is that you can add texture. Use this on the Viking II. In any case, be prepared to pay big dollars. It's expensive to paint one cabinet and the setup charges kill you.

10. "I don't have a Variac to bring my equipment 'up' with. I've designed something that seems to work, though. The photo is attached to this email. It is a plug going into 117 VAC, to a regular household on-off switch, one side of the electrical goes through a socket, and then to a double plug where the rig is plugged in. This picture shows the socket with a fuse in it, but as I bring up an old radio, I start with a 25-watt light bulb for a couple of days. Then I graduate to a 60-watt bulb, then 100 watts. If that procedure doesn't produce any smoke, I put in the fuse for a direct connection to 117 VAC. If something's shorted, the 25-watt bulb will glow brightly. If things are OK, it doesn't glow at all. The same with the higher wattage bulbs. I know this isn't

very sophisticated, but it seems to work. Is this satisfactory or should I just break down and get a Variac?"

Your setup is innovative but, *get a Variac!* They are cheap and absolutely mandatory! They are nearly always available on eBay at reasonable prices.

I hope my answers to some of the questions I've received are useful in your restoration efforts.

Here is a brief summary of a typical (if such a thing exists) restoration process:

1. Take a few "before" photos. You do have a digital camera, right? If you don't, now is the time. Take high resolution shots of *everything*, especially lead dress and mechanical assemblies. Believe me, as you disassemble you *will* forget what goes where!

2. Disassemble as much as is practical. Use numerous small containers, well marked for future reference. Make drawings of mechanical assemblies as you remove them.

3. Wash and clean *everything* as detailed previously. Send out any items that will need painting or plating; panels, cabinet, etc.

4. Test all tubes and replace as necessary. When replacing tubes, place a dab of DeOxit® on each pin before inserting it back into the socket.

5. Replace all electrolytics and coupling capacitors and any others that look "suspect." I generally replace all paper (wax) capacitors as well. Measure resistor values and replace as necessary. Refer to the schematic to ensure resistance readings make sense. Replace any resistors that show evidence of overheating.

6. Test all transformers for continuity and leakage. Replace, or have them rewound as may be necessary. If any of the transformers or chokes are rusty, etc., remove them from the chassis, disassemble, then clean and paint. I use automotive paint in spray cans. Transformers are generally one of

the first items installed during manufacture so lead removal can be very difficult. If it would be difficult to unsolder leads, the transformer may be painted in place by loosening or removing mounting screws; slightly lifting the transformer off the chassis and using painter's tape placed under the mounting tabs and body. This way, you can spray right down to the chassis. Protect everything else from overspray with paper, old towels, etc.

7. Make any suggested modifications and document the changes you make.

8. Clean and lube all switches and controls.

9. Lubricate mechanical assemblies and fans. Less is better. In general, I don't use anything on plastic or nylon gear assemblies and only a little dab of lithium grease on aluminum or steel gears.

10. Replace hardened rubber grommets.

11. As you begin reassembly, replace all rusty or otherwise ugly looking hardware with new stainless steel parts. Even though the stainless is not original, I replace all slotted screws with easier-to-use Phillips head.

12. Replace the line cord if necessary.

13. Power up with great care using a Variac. Before applying power, ensure there are no high voltage or low voltage short circuits.

14. Troubleshoot and repair as may be necessary.

Visit my website (http://www.isquare.com/personal_pages/ras-hardware.htm) for many photos and stories of my restorations. What you see may energize you to get you going on your restoration. Remember that old receiver you bought at a hamfest 10 years ago and stashed somewhere in the garage? Dig it out and get going!

1. Sullivan, Bob, WØYVA, "Restoration of a Central Electronics 600L Amplifier," Electric Radio #179, April 2004, page 22.

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